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The Distribution and Range Extension in Victoria of the Butterfly *Ocybadistes walkeri sothis* Waterhouse

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Abstract

Ocybadistes walkeri sothis is now well established in the Melbourne area and has become widely distributed in Victoria during recent years. This extension of the former range is documented and the possible reasons for it discussed.

Introduction

Ocybadistes walkeri Heron (Lepidoptera: Hesperiiidae) is a small butterfly in the group called skippers, because of their darting flight. Its wing-span is about 26 mm and the larvae feed on grasses. It was described in 1894 from Damar, Indonesia, and is found widely in Indonesia, Papua-New Guinea and Australia. Six subspecies have been described. Four of these are found in Australia; *O. walkeri sothis* Waterhouse (Fig. 1), the Yellow Banded Dart, from Yeppoon and Rockhampton, Queensland, south through central and coastal New South Wales, Victoria, and

Tasmania; *O. w. hypochlorus* Lower, the Southern Dart, is confined to south-eastern South Australia; *O. w. sonia* Waterhouse occurs south from the Shelburne Bay region of Cape York Peninsula (Monteith and Hancock, 1977) to Mackay, Queensland; *O. w. olivia* Waterhouse is restricted to the western sector of the "top end" of the Northern Territory (Common and Waterhouse, 1981). The latter two subspecies do not have common names.

Historical References

With one exception all authors prior to Common and Waterhouse (1972) regarded *O. walkeri* as absent from Victoria. The exception was Meyrick and Lower (1902) who included the distribution "Gisborne, Melbourne, etc." for *Apaustus sunias* (Felder) (*O. walkeri* being given as a synonym). These authors were not confusing this skipper with the White Grass Dart, *Apaustus papyria* (Boisduval), because



Fig. 1. *Ocybadistes walkeri sothis*.

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this was separately listed and given the same distribution. We regard their distribution for *A. sunias* (= *walkeri sothis*) as incorrect, because Waterhouse and Lyell (1914) gave no Victorian records (under *Padraona flavovittata flavovittata* Latreille). G. Lyell was resident in Gisborne and was responsible for most collecting in that area during the early part of this century and would have been expected to have known of the Gisborne record and would have included it in the 1914 book with Waterhouse. The later comment by Waterhouse (1932) that "though searched for, it has not been found in Victoria" also seems to confirm the error. The error appears to be further confirmed by the lack of specimens and literature notes to support the Meyrick and Lower distribution.

Common and Waterhouse (1972) did not directly state that *O. walkeri* occurred in Victoria, but this was implied in the connecting of the records from southern New South Wales (Riverina and Pambula) through eastern Victoria with those of Tasmania on the distribution map for the species. Gisborne and Melbourne were excluded in this map. We have not been able to find the data used to support this extension. However, Common and Waterhouse do give recent Victorian records in their 1981 edition and increase the distribution area on their map to include Melbourne.

Recent Records in Victoria

Less than three decades ago there were no published records of *O. walkeri* from Victoria, other than those of Meyrick and Lower (1902) which we consider erroneous. The first authenticated record appears to be from East Gippsland and this together with the initial and subsequent early records for localities in the major regions of Victoria are set out in Table 1. We have also included in Table 1 the early records from Melbourne, up to the end of the 1979-80 flight season, to give a clearer

perspective for the early records for the State as a whole.

Because the early records are important in tracing the apparent steps in the butterfly's range extension, the data on Table 1 is amplified in the following comments.

The earliest records of *O. w. sothis* in Victoria came from Noorinbee, near Cann River, where A. May caught specimens early in December 1960 on flowers of *Buddleia* growing in his garden. These records were never published. On 30 January 1972 J. Landy took specimens in association with Kikuyu grass at Malla-coota.

O. walkeri sothis is not regarded as a mountain species, thus the records from Mt Baw Baw (1500 m) and Mt Erica (1100 m) are significant and possibly indicate that the butterfly may be found in other mountain areas.

The specimens caught by Landy and Crosby at Kerang in March 1979 were feeding on small road-side flowers amongst Couch Grass, which was probably the foodplant.

The first record from Melbourne was in late March 1977, when A. Kinsella identified "a single freshly emerged" specimen at East Brighton. In the following season, A. Atkins found the species "very common" at Black Rock on 21 February 1978, and in March 1979, C. McCubbin photographed specimens in his garden at Box Hill North.

Although specimens have been caught recently at Rainbow and Nhill by F. Douglas, there are no records from the Mt Cole area or the Grampians. A recent record by J. Landy at Anglesea extends the range along the western coast, but there are no records further west into the Otways or the south-western coastal area between the Otways and South Australia.

From the flight season commencing in October 1980, the species spread rapidly in suburban Melbourne and the nearby country areas. Table 2 shows the records

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Table 1. The initial and early records of *Ocybadistes walkeri sothis* in major regions in Victoria and Melbourne

Locality	Date	Collector	Reference
East Gippsland			
Noorinbee	Dec. 1960	A. May	Pers. comm.
Mallacoota	30 Jan. 1972	J. Landy	Pers. comm.
Bemm River	Jan. 1974	R. Field	Pers. comm.
Mallacoota	Feb. 1976	J. Landy	Pers. comm.
Gipsy Point	15 Nov. 1984	M. Hunting & D. Crosby	
Gippsland			
Tonimbuk	18 Dec. 1983	K. Dunn	
Millgrove	3 Mar. 1985	D. Gooding	Carwardine (1985)
Nyora	30 Nov. 1985	K. Dunn	
Mt Baw Baw	29 Mar. 1986	A. Morton	Pers. comm.
Cannons Creek	14 Dec. 1987	K. Dunn	
Mt Erica	17 Feb. 1988	K. Dunn	
Inverloch	2 Feb. 1989	K. Dunn	
Central Victoria			
Rutherglen	25 Mar. 1973	S. McEvey	McEvey (1973)
Benalla	23 Feb. 1984	M. Braby	Pers. comm.
North-Western Victoria			
Gunbower	2 Jan. 1976	A. Atkins	Atkins (1976)
Kerang	19 Apr. 1976	A. Atkins	ANIC
Kerang	31 Mar. 1979	J. Landy & D. Crosby	
Mildura	23 Oct. 1983	D. Holmes	Pers. comm.
Western Victoria			
Hanging Rock, Woodend	5 Apr. 1985	M. Braby	Pers. comm.
Lerderberg Gorge	1 Dec. 1985	S. Smith	Sattler, Pers. comm.
Melton	30 Oct. 1987	I. Faithfull	Pers. comm.
Rainbow	31 Oct. 1987	F. Douglas	Pers. comm.
Castlemaine	9 Mar. 1988	D. Crosby	
Anglesea	Mar. 1989	J. Landy	Pers. comm.
Nhill	9 Apr. 1989	F. Douglas	Pers. comm.
Wycheproof	19 Apr. 1989	F. Douglas	Pers. comm.
Melbourne			
Brighton E.	Mar. 1977	A. Kinsella	Kinsella (1977)
Black Rock	21 Feb. 1978	A. Atkins	Atkins (1978)
Box Hill N.	Mar. 1979	C. McCubbin	Pers. comm.
Toorak	1 Mar. 1980	D. Crosby	
Oakleigh S.	1 Mar. 1980	M. Hunting	Pers. comm.
Doncaster E.	17 Mar. 1980	N. Quick	Pers. comm.
Glen Waverley	28 Mar. 1980	N. Quick	Pers. comm.

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for the period up to the end of the 1986-87 season. Further expansion has been noted to other adjacent areas since then. The Table 2 records and those from Melbourne in Table 1 are shown in the map, Fig. 2.

Interstate Records

South Australia

Specimens in the South Australian Museum caught on 21 March 1983 by K. R. Germein at Barmera, although rather

worn, appear to be *O. walkeri sothis* (confirmed by Fisher, pers. comm.). M. Moore (pers. comm.) reports that the species has been in the Waikerie district since 1976 and that it occurs "from early summer to late May". Specimens from this area have not yet been examined to determine the sub-species to which they belong. However, a single specimen taken by Morton at Naracoorte on 21 December 1984 appears to be *hypochlorus*. Fisher (pers. comm.) advises that the latter sub-

Table 2. Initial location records of *Ocybadistes walkeri sothis* in Melbourne and nearby areas.

Map Ref.*	Locality	Date	Collector	Ref.
1	Malvern	Dec. 1980	P. Carwardine	Carwardine (1981)
2	Dandenong	7 Feb. 1981	K.L. Dunn	
3	East Melbourne	24 Nov. 1981	D.F. Crosby	
4	Prahran	Nov. 1981	D.E.A. Morton	Morton (1985)
5	Eltham	6 Dec. 1981	M.F. Braby	Pers. comm.
6	Blairgowrie	29 Mar. 1982	J.C. LeSouef	ANIC
7	Camberwell	13 Oct. 1982	I. Faithfull	Faithfull (1985)
8	Hurstbridge	Nov. 1982	T.R. New	Pers. comm.
9	Sherbrooke	1 Dec. 1982	K.L. Dunn	
10	Dromana	23 Dec. 1982	D.R. Holmes	Pers. comm.
11	South Yarra	10 Feb. 1983	I. Faithfull	Faithfull (1985)
12	Lysterfield	20 Feb. 1983	M.F. Braby	Pers. comm.
13	Abbotsford	1 Nov. 1983	I. Faithfull	Faithfull (1985)
14	Yarra Bend	12 Nov. 1983	I. Faithfull	Faithfull (1985)
15	The Basin	5 Dec. 1983	K.L. Dunn	
16	Collingwood	11 Feb. 1984	I. Faithfull	Faithfull (1985)
17	Studley Park	18 Feb. 1984	I. Faithfull	Faithfull (1985)
18	Brunswick	9 Nov. 1984	I. Faithfull	Faithfull (1985)
19	Bundoora	22 Dec. 1984	M.F. Braby	Pers. comm.
20	Mt. Dandenong	8 Feb. 1985	K.L. Dunn	
21	Rye	31 Mar. 1985	M.F. Braby	Pers. comm.
22	Hampton	14 Apr. 1985	M.F. Braby	Pers. comm.
23	Eaglemont	12 Nov. 1985	M.F. Braby	Pers. comm.
24	Macleod	30 Nov. 1985	M.F. Braby	Pers. comm.
25	Christmas Hills	15 Dec. 1985	M.F. Braby	Pers. comm.
26	Greensborough	29 Dec. 1985	M.F. Braby	Pers. comm.
27	Belgrave Hts.	4 Mar. 1986	K.L. Dunn	
28	Yarrambat	30 Nov. 1986	M.F. Braby	Pers. comm.
29	Burnley	15 Dec. 1986	M.F. Braby	Pers. comm.
30	Kangaroo Ground	31 Jan. 1987	M.F. Braby	Pers. comm.
31	Narre Warren Nth.	4 Apr. 1987	K.L. Dunn	

* The numbers shown in the column "Map Ref." correspond with those shown on the map in Fig. 3.

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species occurs in Adelaide, south to Myponga, north to Port Augusta, and on the Yorke Peninsula at Moonta and Wallaroo. If *hypochlorus* does occur at Naracoorte, the dividing line between that sub-species and *sothis* must be in the 110 km between there and the recently discovered colony at Nhill. Therefore, it would be interesting to survey the area between those two towns to locate colonies for study.

New South Wales, A.C.T., Tasmania

In New South Wales *O. w. sothis* is principally a coastal or near-coastal butterfly. On the south coast, it was recorded as far south as Pambula and Merimbula seventy years ago, and in the south west it was recorded from Deniliquin (Common and Waterhouse, 1981) and Leeton. Braby (pers. comm.) recorded it at Griffith on 27 December 1986, and Faithfull (pers. comm.) took it at Broken Hill on 23 April

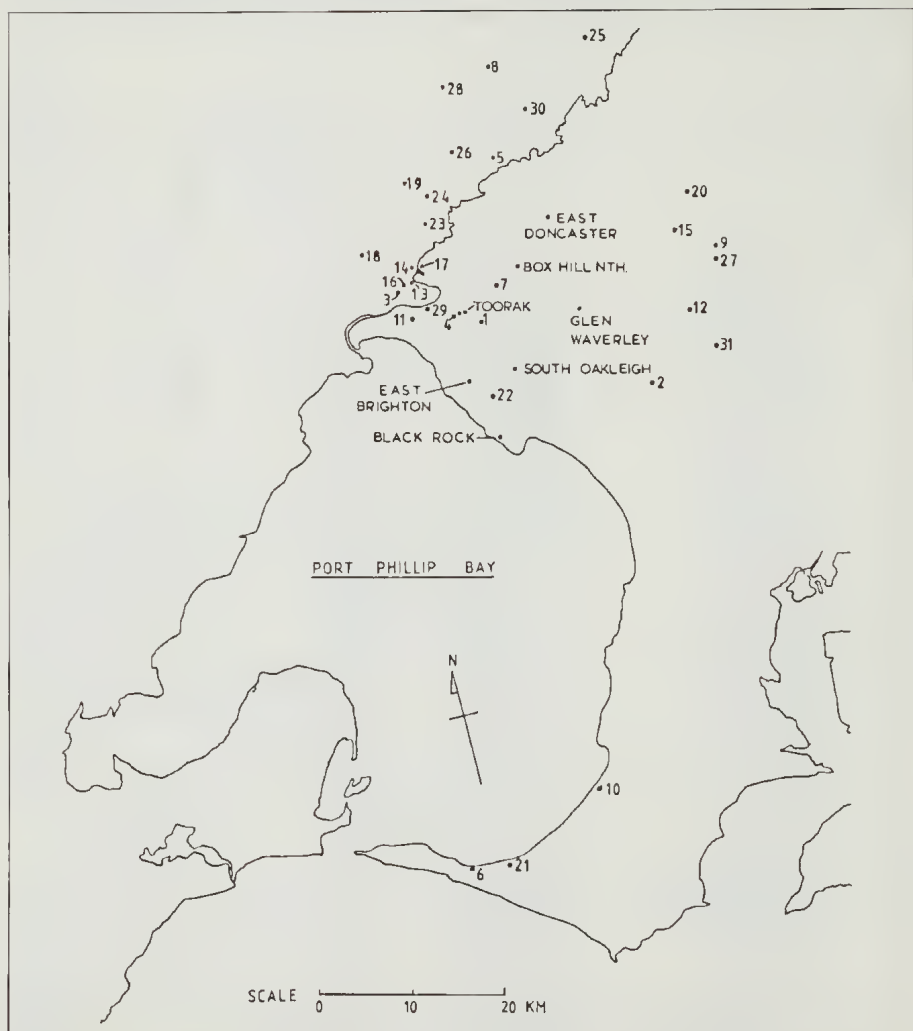


Fig. 2. Distribution of *Ocybadistes walkeri sothis* in Melbourne and nearby areas.

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1988. It has been caught at the summit of Mt. Ainslie, A.C.T. (843 m) by Dunn and Atkins, the specimens being in the Australian National Insect Collection, Canberra (ANIC). The butterfly has been recorded from Mt. Painter, A.C.T. (743 m) (Kitching *et al.* 1973). There are no specimens in the ANIC from the Brindabella Range, west of Canberra, nor from the Kosciusko-Snowy Mountains in the south.

Couchman (1956) states that in Tasmania *O. w. sothis* is known from north-west, north and eastern coastal areas from sea level to c.750 feet (230 m) and Couchman and Couchman (1977) placed it in a list of "coastline and shoreline species up to circa 600 metres". Couchman (pers. comm.) confirms that this is still accurate and that there are no records from the Bass Strait islands yet. He states that he has never had the slightest evidence of human introduction of the species to Tasmania.

Figure 3 shows the distribution of *O. walkeri* in south-eastern mainland Australia.

Discussion

Since 1980 *O. w. sothis* has become firmly established in the east, north and north-west of the state and in the Melbourne area. A large number of records both from specimens in collections and from the literature confirm this range extension. There are no records indicating that this species migrates (see Smithers 1978).

Except for the Melbourne area the range extensions appear to be from natural dispersal. Thus, in East Gippsland, the Mallacoota and Gipsy Point records could have resulted from a southern extension from southern New South Wales. Records from Pambula on the coast about 75 km north of Mallacoota date from before 1914, and there is a Waterhouse specimen in the Australian Museum, Sydney, from Mcrimbula (5 km north of Pambula) dated 9 October 1903, and two others by G. H. Murray from Moruya dated 10 April 1903. However, many collectors, including



Fig. 3. Distribution of *Ocybadistes walkeri* in south-eastern Australia.

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Crosby, have often visited the Mallee area prior to 1972 without recording the butterfly there. The western extension to Bemm River probably represents a natural coastal extension from Mallee. The Noorin records could have come from a further western extension from the eastern colonies but, because there have been some unusual records of several typically northern butterflies and moths at Noorin in the early 1960's (Burns 1960, 1962, 1962a, 1963), these records of *O. w. sothis* may have come from unrecorded colonies to the north.

Until his death in 1980, C. G. L. Gooding collected extensively in Gippsland for over sixty years and did not record the species in Victoria. Mt Baw Baw has been visited by butterfly collectors for many years and no record of *O. w. sothis* was obtained until that of Morton in March 1986. The species is unlikely to have been overlooked prior to that time. Apart from the interest of this unusual record in a mountain area, there is the difficulty in determining how the butterfly reached Mt Baw Baw and nearby Mt Erica. On current evidence, we feel that these records represent part of the eastern expansion from the Melbourne area.

Range extension through natural dispersal would account for the record at Rutherglen in the north-central area of Victoria. In the N.S.W. Riverina area to the north, specimens were taken at Leeton and Deniliquin prior to 1972, and the species could gradually spread southwards, accounting for McEvey's 1973 record. Extension further south would probably account for the Benalla captures by Braby in February 1984.

In the north-west, along the Murray River, the Kerang district had been intensively surveyed, particularly by resident collector R. E. Trebilcock, during the period 1906 to 1976. No specimens appear to have been recorded from there until 1976. A natural south-western extension

from the colonies which have been known to exist in the N.S.W. Riverina area could account for these records, and also for the very recent discoveries at Rainbow and Nhill. A more western extension from the Riverina could reach Mildura and extend even further west to Barmera and Waikerie in South Australia. The record of a specimen at Griffith N.S.W. could also represent a Riverina expansion.

The sudden appearance of *O. w. sothis* in Melbourne does not seem to be so easily explained because of the timing of the records and the apparent distance from other colonies known at that time. We consider that the following causes may be possible explanations for this expansion:

- i. The butterfly may have been in Melbourne for a long time, but in an isolated, undiscovered colony.
- ii. The species may have reached Melbourne by natural expansion.
- iii. Accidental or deliberate introduction may have been involved.

As there have been active butterfly collectors in Melbourne for a century, it seems very unlikely that a relict colony could have persisted there undiscovered and have expanded suddenly in this way. Butterfly populations vary in size depending on seasons but the recorded expansion in the Melbourne area is too rapid and widespread to be explained by natural expansion and dispersal alone, even under the most favourable conditions, from what would have to have been a very restricted colony to have remained undiscovered. Thus we do not believe that the Melbourne records were derived from this source.

The natural dispersals which were recorded in the other areas of the State were probably rapid and appeared to cover large distances, presumably under conditions which were favourable to the butterfly. The most probable source of the Melbourne colonization from natural dispersal would be from the north, by extension from the Benalla area. The early records in Mel-

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bourne would then have been in the north of the city, with a gradual widening of records east, south and west thereafter. This does not appear to have been the case because there was a sudden surge in records in widely separated areas of Melbourne in a relatively short period (Table 2). Accordingly, we feel that an alternative, or at least supplementary, explanation is required.

Could the butterfly have been brought into Melbourne? This solution appears possible. The cabbage white butterfly was inadvertently introduced. However, it seems unlikely that anyone would set out to establish a colony of such a small, drab insect of no economic or particular scientific interest. The intentional establishment of a colony would require breeding of a number of adults to ensure viability, and release into an area where there was abundant foodplant, Kikuyu (*Pennisetum clandestinum* Hochst.) or Common Couch (*Cynodon dactylon* (L.)). The use of these two plants, particularly the former since the 1950s, for lawns (with consequent garden and street escapees) would, however, facilitate this. Both grasses are very hardy in poor soils in hot climates, suitable for the butterfly. From the way the species has rapidly become established over the past ten years, such a course could have been successful, but the action lacks obvious motivation.

Accidental introduction thus appears the most probable alternative. In 1974-76 the Melbourne instant lawn trade purchased large quantities of grass grown near Sydney. Included were Buffalo (*Stenotaphrum secundatum* (Walt.)), Kikuyu, and Common Couch. The greater part of these consignments was used in Melbourne, with Buffalo and Kikuyu being laid in public areas, such as nature strips, ovals and schools. Common Couch was generally used in less demanding situations and domestic applications. Large quantities of all types came from grass growers in the Richmond-Windsor region, where *O. walkeri* is known to occur.

Normally, insecticides were not used in the early farming of grasses because the grasses were not badly attacked by pests. However, some herbicides, principally 2-4D, were used to control weeds. The sward is kept to a height of about 50 mm by mowing and the cuttings are allowed to fall. These procedures would not be detrimental to the breeding of the butterfly, which is often associated with marginal agricultural activities and domestic gardens. In the grass farms the grass is well watered, in warm locations, and generally not harvested until November. Transport of the harvested grass in rolls from Sydney would involve some sweating and heat generation but these are kept to the minimum to prevent deterioration. There were no relevant quarantine restrictions operating at the time, and early stages of *O. walkeri* could have been transported in grass rolls without great losses.

Transport costs eventually made the Sydney supply uneconomic and in the late 1970s and early 1980s supplies came alternatively from Narrandera, Albury-Wodonga, and the Seymour-Avenel districts, all of which were or had possibly become breeding areas for the butterfly. It is interesting to note that in 1976-77 there was a bad drought in the Riverina and large shipments of domestic grass cuttings from Sydney were brought in for stock feed. It is possible that juvenile stages of the butterfly on these grass cuttings could have further aided its spread. Grass farms have now been established near Melbourne with the result that supplies from Narrandera have ceased and have been substantially reduced from Albury-Wodonga.

If the butterfly came in the instant lawn consignments, it is possible that relatively large numbers could arrive at one location at one time. Thus, with foodplant immediately available, rapid establishment of a viable colony could be relatively easy. Furthermore, the consignments would have been scattered and colonies could spring

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up over a wide area over a few seasons, leading to an apparent "explosion" of the species, consistent with what has been observed.

A general tendency towards western and eastern extensions from Melbourne seems to be noticeable in the recent records. For example, Melton and Castlemaine to the west and southern Gippsland and the mountain areas to the east, including Mt Baw Baw, Millgrove, Cannons Creek.

No investigation into the possible causes for the rapid expansion of *O. walkeri sothis* has been undertaken and this would be an interesting project. We believe that favourable climatic conditions have helped, but such factors as genetic changes and a change in the foodplant preferences may have contributed. The use by the butterfly of Panic Veldt Grass (*Erharta erecta* Lam.), a common exotic weed in Melbourne gardens, has been noted on many occasions since it was recorded by Carwardine in December 1982 (pers. com.) and adaption to this foodplant should have assisted the establishment of new colonies by the transfer of garden plants mixed with this weed already carrying eggs or larvae of the butterfly.

Conclusion

The rapid colonization of large sections of Victoria by *O. walkeri sothis* is an interesting example of a range extension of an Australian butterfly. This contrasts with so many species whose distributions are contracting because of habitat loss. We believe that the available evidence points to there being three causes for this expansion: a natural invasion south and west from the Riverina; a natural invasion south-west from the south coast of New South Wales; accidental introduction into the Melbourne area. We consider that *O. walkeri* is now permanently established in Victoria. Further evidence may help to determine whether the suggested alternatives or other causes actually applied in the expansion process. A study of the methods

of dispersal and the reasons for the rapid increase in the rate of dispersal of this butterfly would be valuable.

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